TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE Boise, Idaho SOIL CONSERVATION SERVICE

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INSTREAM FLOW REQUIREMENTS FOR TROUT

Understanding instream flow requirements for trout is essential for an environmentally sound stream management program.

A limited amount of research has been undertaken on instream flow requirements for trout. This technical note summarizes material obtained from studies by fish and game departments in Montana, Oregon, and Wisconsin and by the U.S. Forest Service. 1/

PASSAGE CRITERIA FOR TROUT

	Minimum Depth	Maximum Velocity
Dolly Varden and Lake Trout	0.6 ft.	8.0 fps
Other Trout	0.4 ft.	4.0 fps

TROUT SPAWNING CRITERIA

Water velocity (fps)	1.0 to 3.0
Water Depth (ft) minimum	0.5 to 1.8

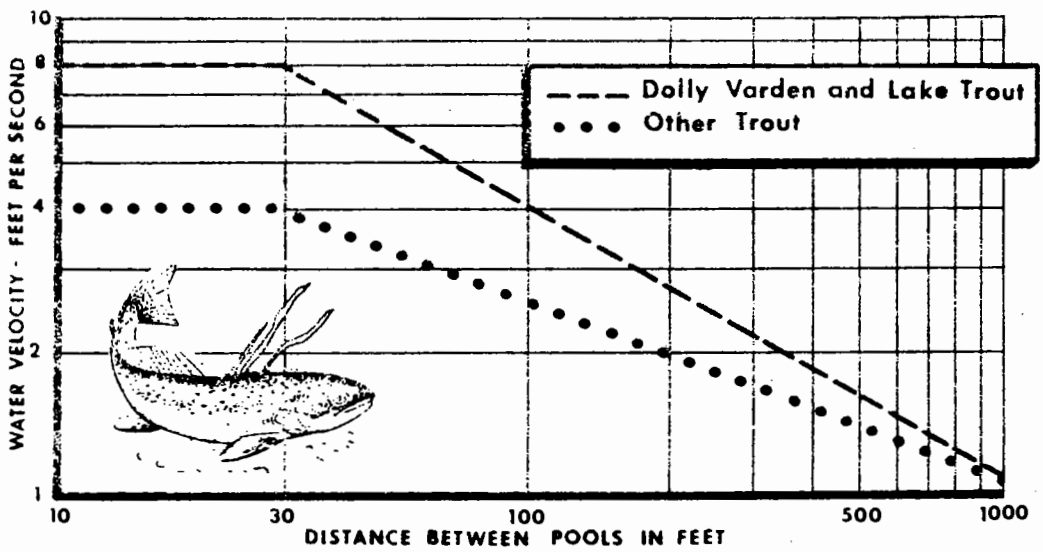
TROUT SPAWNING AND INCUBATION SEASON

Species (Common Name)	Spawning	Incubation
Rainbow Trout	April-July	June-September
Cutthroat Trout	April-July	June-September
Brown Trout	October-November	November-January
Brook Trout	October-November	November-January
Dolly Varden Trout	September-November	November-March
Lake Trout	October-November	November-March

SPAWNING GRAVELS

Trout utilize gravel for spawning which ranges in size from 0.5 to 3.0 inches in diameter. It is important that the gravel environment remain free of silt while trout eggs are incubating.

Maximum Velocity Versus Distance Between Pools for Trout



GUIDELINES FOR IDEAL REARING FLOWS

1. Adequate depth over riffles with 0.2 ft. as the minimum.
2. Riffle-pool ratio near 50:50.
3. Approximately 60% of riffle area covered by flow.
4. Riffle velocities of from 1.0 to 1.5 fps.
5. Pool velocities of from 0.3 to 0.8 fps.
6. Most stream cover available as shelter for fish.

General Minimum Flow Requirements

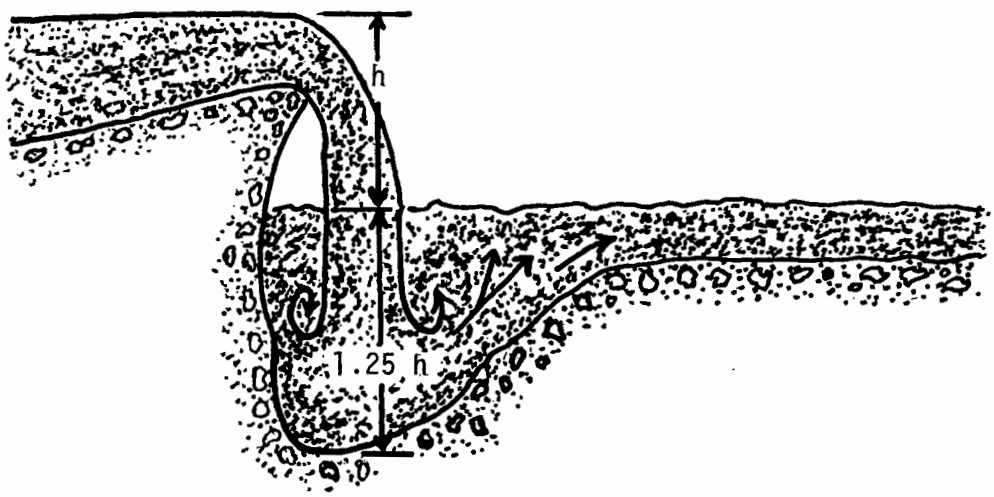
As a general rule, the following percentages based on mean annual flow of record, can serve as guidelines.

	Period
30% flow	October through March
60% flow	April through September

A 10% flow would be considered as a short term survival flow.

OBSTRUCTIONS

The maximum height to which trout will jump while negotiating an obstruction is unknown, but the height can be increased by creating a pool or hole below the obstruction, which in depth is 1.25 times the height of the obstruction. This pool increases currents to aid the fish in their jump. When designing especially for fish passage, height should be 12 inches or less; in no case should height be greater than 18 inches.



CULVERTS

Culverts should be placed so that no outfall of water would necessitate fish jumping.

VELOCITIES IN CULVERTS

Length of Culvert	Maximum Velocity for Trout
Less than 100 ft.	4 fps
Greater than 100 ft.	2 fps

Culverts may block fish passage if the drop at the outfall is excessive or if they are placed at a steep gradient. Bridging is the recommended method for crossing streams.

If culverts are utilized, they should be kept on a gradient of or below 1.0%.

Recommended flows in this technical note should serve only as guidelines.

1/ REFERENCES

1. Guidelines for Management of Trout Stream Habitat in Wisconsin, Department of Natural Resources, Division of Conservation, 1967.

2. Determining Stream Flows for Fish Life, Oregon State Game Commission, Environmental Management Section, 3/1972.

3. Proceedings of the Instream Flow Requirement Workshop, Sponsored by Pacific Northwest River Basins Commission, March 15-16, 1972.

4. Stream Habitat Evaluation Technique, U.S. Forest Service, Region 3, June, 1970.

5. A Technique for Sampling General Fish Habitat Characteristics of Streams, U.S. Forest Service, Research Paper INT-41, 1967.